Attachment 1: Description of Emission Reduction Measure Form

Please fill out one form for each emission reduction measure. See instructions in Attachment 2.

Title: Reduce Healthcare HFC emissions by 99%

Type of Measure (check all that apply):

- ☒ Direct Regulation
- ☒ Monetary Incentive
- ☐ Voluntary
- ☐ Other Describe:
- ☐ Market-Based Compliance
- ☐ Non-Monetary Incentive
- ☐ Alternative Compliance Mechanism

Responsible Agency: ARB

Sector:

- ☐ Transportation
- ☐ Other Industrial
- ☐ Agriculture
- ☐ Sequestration
- ☐ Electricity Generation
- ☐ Refineries
- ☐ Cement
- ☒ Other Describe: **Healthcare/hospital**

2020 Baseline Emissions Assumed (MMT CO2E): 1.0

Percent Reduction in 2020: 99%

Cost-Effectiveness ($/metric ton CO2E) in 2020: 3.60

Description: A little-known source of greenhouse gas (GHG) emissions is the dumping of volatile halogenated anesthetic gases from operating rooms in hospitals and ambulatory surgery centers. Although they represent a small fraction (<1%) of all GHG emissions, they are amenable to almost complete reduction with recently-developed technology. Anesthetic Gas Reclamation, LLC has developed a process of cold-trap condensation which is both efficient and inexpensive. It places a -100C condenser system near the hospital exhaust outlet for waste anesthetic gases (WAG) and captures 99% of emissions of halogenated anesthetics. At a capital cost of $5000 per operating room (and almost no ongoing operating cost), this represents an opportunity to gain an appreciable reduction in GHG emissions for a minimal investment. Other similar technology has been developed by Blue-Zone (a Canadian company), but they do not share the low cost advantage of AGR.

Emission Reduction Calculations and Assumptions: California is assumed to have approximately 4000 locations where general anesthesia is delivered (operating rooms or equivalent). Each location uses 12.5 gallons of liquid anesthetic/year. Each gallon of

anesthetic, when dumped into the atmosphere after use, produces the global warming equivalent of 10 metric tons of CO2 (GWP of anesthetics varies between 800 and 1700 per 2d IPCC). Total 2006 annual emission in California is 0.5 MMT CO2 equivalent. This assumes no growth in emissions. At 10% annual growth in surgical procedures, 2020 estimates are just over 1.0 MMT/yr.

Cost-Effectiveness Calculation and Assumptions: The cost of equipping one anesthetizing location is $5,000 with an operational lifespan of 10 years; ongoing costs are $400/yr. A total cost over 10 years is $36 million, averaging $3.6 million/year or $3.60 per ton of CO2 in 2020.

Implementation Barriers and Ways to Overcome Them: One limitation to the widespread implementation is the requirement for a dedicated WAG disposal system in hospitals. All newer hospitals have this system, but some older institutions would be required to add internal piping at a cost of approximately $10,000/operating room.

Funding for this implementation could be any combination of subsidy, hospital investment (with tax incentive), and/or revenues from a CO2 emissions trading scheme (like Kyoto agreement inspired CO2 credits currently trading in the European Union).

Potential Impact on Criteria and Toxic Pollutants: The resulting scavenged anesthetic would be removed from the State at no additional cost to dedicated reprocessing facilities.

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